The Evolving Face of Ecosystem Management

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Environmentalists have long advocated ecosystem management as the choice resource management paradigm. Ecosystem management grew organically from preceding management paradigms, such as utilitarianism, as these regimes failed to satisfy social values. Managers began realizing the importance of managing from an ecosystem perspective and that translated into the government adoption of this paradigm in the early 1990s. Studies have been done to determine how ecosystem management concepts and implementation have been evolving. This study examines the use of the term “ecosystem management” in scholarly literature and by federal agencies who adopted this paradigm. Data suggest that the use of this term has declined since the late 1990s, with change involving primarily etymological and bureaucratic factors.

Keywords ecosystem management, federal agencies, etymology

Though components of ecosystem management (EM) date back to the early 1900’s, EM has not always been the dominant resource management paradigm. Of prominence then was traditional utilitarian resource management, which predominantly viewed resources as commodities and amenities for human consumption while de-emphasizing intrinsic needs or values of the ecosystem’s inherent worth. Growing pressures on the resources, from population growth to other increasing demands, led to destruction to the point of multiple failures in traditional management. Simultaneously, increasing concerns about long-term sustainability of ecosystems and biodiversity led to calls for a more holistic approach, integrating human use into the larger concern for ecosystem health. These conditions sparked serious consideration of ecosystem management among managers as an alternative to traditional management.

As the concept of ecosystem management gained popularity and momentum, several government entities began to implement EM. In 1990, the twenty-first annual report of the Council on Environmental Quality advocated the nation to take an ecosystem approach to address its environmental issues. (Cortner, 1999) In 1993, the Clinton Administration’s National Performance Review released its environmental report, *Reinventing Environmental Management*, which recommended cross-agency ecosystem planning and management under all federal programs affecting ecosystems. In 1994, as part of symposium convened by the Congressional Research Service (CRS) at the request of several congressional committees, eighteen federal agencies reexamined and sought to improve the activities they have pursued in the name of ecosystem management. (Morrissey, 1994) Most of the agencies continue to this day implementing at least a version of ecosystem management, as discussed in the research section.

Fundamentals of Ecosystem Management

What is Ecosystem Management?

Due to the broad nature of the term and the varying values of those defining the term, definitions of "ecosystem management" vary significantly. An often-cited definition in literature came in a 1994 article by David Grumbine: "Ecosystem management integrates scientific knowledge of ecological relationships within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long term." Definitions also range, however, from "regulating internal ecosystem structure and function, plus inputs and outputs, to achieve socially desirable conditions" (Johnson and Agee, 1988) to "characterized by synthesis or integrated knowledge, a holistic perspective interrelating systems at different levels of integration, an actions that are ecological, anticipatory, and ethical in respect to other systems of Nature" (Francis 1993, 331) Another definition should be noted: according to More, a precise definition would be limiting and is simply not in the cards because EM is similar to the central but imprecisely defined concepts that guide other professions, such as "health" in medicine and "justice" in law. (1996) As one author writes of understanding ecosystem management, "…everybody 'knows' what it means, but after not very much discussion of the subject, it turns out that everybody's meaning differs to some degree" (Ruhl 1999)

Also necessary when mentioning the definitions of ecosystem management are the components of ecosystem management. Because Grumbine, for example, delineated more components of ecosystem management in his paper than simply the definition, looking at that his definition alone would be incomplete. The components that emerge include: the need for hierarchical context (1) in recognizing various scales of ecological interaction, boundaries, and integrity (2). In addition, spatial and temporal management changes (3) are suggested as applied to data collection (4) and monitoring (5), which must be done and used in ways that compliment the more complex management areas and the larger goal of ecosystem integrity. Organizational change (6) is also included, along with adaptive management (7) and interagency cooperation, (8) speaking to the need for institutions and agencies to be able to cooperate and adapt to changing knowledge and ecosystem needs. The final two themes deal with including human needs as necessary considerations when determining how ecosystems should function (9) and defining management goals within the context of 'humans embedded in nature' and 'human values' (10).

Cortner (1999) also delineated four EM components: holistic, integrated science; socially defined goals and objectives; adaptable institutions; and collaborative decision-making. When compared with Grumbine, most of Cortner's components can be equated with Grumbine. (Grisard, 2005) A significant difference, however, is that Cortner explicitly includes collaborative decision making, as opposed to the general "human values" and "interagency cooperation" components of Grumbine. Collaboration could be argued as necessary when determining what values to incorporate as multiple stakeholders, including agency officials, work together.

Though no one standard exists for the definitions and components of ecosystem management, main concepts includes an inter-disciplinary use of science, defining natural boundaries as management boundaries, including human values and needs into management goals and objectives, creating management agencies able to adapt to changing ecosystem and societal needs, and collaborative decision making that includes a variety of stakeholders. (Cortner and Moote, 1999)

Criticisms of Ecosystem Management

A prominent criticism of ecosystem management involves boundaries. Political scientists have noted the necessity of choosing ecosystems with both political as well as ecological significance. The problem is that this notion does not go far enough to direct what really is significant politically and ecologically in various real world circumstances. This causes two major issues: ambiguous meanings and boundaries associated with the "ecosystem" as the unit of analysis, and political problems inherent in implementation of ecosystem management across a spectrum of political jurisdictions. (Grisard, 2005; Blomquist and Schlager 2000) When

considering the boundary issue, Cortner and Moote (1999) cited criticisms that ecosystem management is “fuzzy, ambiguous, and untested” and “legally and politically untenable”.

Authors also note many other obstacles to ecosystem management. These obstacles usually include: ambiguous definitions, management authority and conflict, and public mistrust (Yaffee et al 1996). Also significant are the limitations of resources (notably time and financial constraints), properly identifying values of stakeholders, confining laws, fear of litigation, biases/agendas, scientific misunderstanding (Riggs 2001), turf battles between agencies, resistance to change, and improper decision-making frameworks. (Blomquist and Schlager 2000) Given these sorts of criticism, some authors have gone as far as to label EM as simply a buzzword concept bound to fail in actual implementation (Fitzsimmons, 1996)

Background of Research Issue

Many of the criticisms of ecosystem management arose when it gained popularity among federal agencies in the early 1990s. In order to determine frequency of the term “ecosystem management” during this period, Bengston randomly sampled and counted the number of media sources in which EM was mentioned across 24 newspapers, 5 newswires, and 4 television and radio news transcripts contained in the NEXIS database for the entire period 1992 through 1998. (2001) Bengstron found that usage of the term began increasing substantially in 1991, peaked in 1994, and began declining in a parabolic fashion, eventually leveling off to where it began. Bengston characterized the high point as the period of intense public debates and the leveling off as indicative of the debates becoming settled public issues. In addition to counting the prevalence of the term, Bengston also coded each occurrence as positively or negatively portrayed in the story. In 78% of the occurrences, the connotation was positive.

Comparing the use of the term over time, Bengston noted that early on the debates were in regards to whether EM was definable and whether it should be implemented considering the ambiguity and other criticisms. Subsequently, the debate shifted to how EM was being implemented in specific geographic areas. This shift, he argued, along with the decline in frequency of usage, represented conceptual changes to EM to match social values and goals. But Bengston did not, however, describe these conceptual changes. And while the media and the public may have settled the issue, arguably superficially, it is important to understand how the implementing agencies and scholars have used the term. To illuminate from where the EM debates have come and to where they are going, more research is necessary. Utilizing methods similar to Bengston, this paper will determine how EM usage in academic literature has occurred and how agencies perceive EM.

Questions and hypothesis are warranted. Does the academic literature follow the same parabolic fate as Bengston’s media sources? What are some factors influencing usage of the term? Will agency personnel affirm Bengston’s characterization that EM has changed debate and conceptualization? In contrast to the rapid processing of information inherent in the media, we might expect academic literature to lag behind in terms of how many uses are found, as academics need time to properly address the issues. Because Bengston characterized the debates and EM conceptualizations as evolving, we should expect the agencies’ responses to reflect this. However, given Fitzsimmons’ and other EM criticisms, usage may be declining as a result of actual EM implementation declining. These possibilities are tested through research, as described below.

Methods

To obtain information about the use of the term “ecosystem management” by agencies and scholars, this study relied on journal databases and interviews with agency personnel.

Databases

A sample of databases was selected to represent the scholarly literature related to ecosystem management. All journal databases relevant to ecosystem management through the subscriptions that the Ohio State University opens to its faculty and students will be used for measurement. These databases span thousands of journals with millions of articles, across inter-disciplinary fields such as environmental science, nutrition, and zoology. The databases utilized are listed in the Appendix. The exact phrase “ecosystem management” was searched in academic titles, abstracts, and keywords. Each article that was found counted as one occurrence. The number of occurrences per year from 1990-2005 was determined.

Interviewees:

The investigator sought to interview one person from each of the 18 federal agencies that officially adopted ecosystem management in the 1990s (see Table 1 below). Of the original 18 agencies, 2 had been dissolved and 5 could not be reached, yielding 11 interviews in total. The career status of the interviewees were primarily comprised titles such as, “National Program Leader” for the FS or “Environmental Specialist” for the BOR, but some were simply those in the know, such as a doctoral student studying EM in NOAA. The questions were based on the semi-structured interview questions listed in the Appendix. Interviews were conducted by phone in January and February 2006, and each lasted roughly 15 to 30 minutes in length.

Table 1: 18 Federal Agencies that Officially Adopted Ecosystem Management in the 1990s

Agency	Interview status
Department of Agriculture	
-- 1. Extension Service (ES)	Unreachable
-- 2. Forest Service (FS)	DONE
-- 3. Soil and Conservation Service (Natural Resource Conservation Service - NRCS)	DONE
Department of Commerce	
-- 4. National Oceanic and Atmospheric Administration (NOAA)	DONE
-- 5 Department of Defense (DOD)	Unreachable
-- 6 Department of Energy (DOE)	DONE
Department of the Interior	
-- 7 Bureau of Indian Affairs (BIA)	Unreachable
-- 8 Bureau of Land Management (BLM)	DONE
-- 9 Bureau of Mines (BOM)	Unreachable
-- 10 Bureau of Reclamation (BOR)	DONE
-- 11 Fish and Wildlife Service (FWS)	DONE
-- 12 Minerals Management Service (MMS)	DONE
-- 13 National Biological Survey (NBS)	Unreachable
-- 14 National Park Service (NPS)	DONE
-- 15 US Geological Survey (USGS)	Unreachable
16 Environmental Protection Agency (EPA)	DONE
17 National Aeronautics and Space Administration (NASA)	Unreachable
18 National Science Foundation (NSF)	DONE

Findings

Usage of the term "ecosystem management" followed a parabolic trend. (see Figure 1) Usage was increasing from the beginning of the sample in 1990 and began increasing at a substantially faster rate in 1993/1994. Significantly, this occurred around the same time as the aforementioned 1994 CRS convention and Grumbine's 1994 landmark article "What is Ecosystem Management?". (Morrissey, 1994) (Grumbine 1994) Usage increased 75% from 1994 to the peak in 1999. At the peak, usage began declining at roughly the same rate it increased. Looking at only 1994 to 2004 (five years before/after 1999), use generally has fallen to where it began substantially rising. The CSA database is mentioned unique from the other databases because the fact that it has more journals than all the others combined is statistically significant. As indicated, however, with or without the CSA database, the journals followed the same parabolic trend with a peak in 1999. Another important point is that the mater database of databases often doubled-counted articles when the articles were found in many databases. This point would seem moot considering the possibility of this occurring can occur in 1999 just as soon as in 2002. But a pure sample of journals in ISI with no double count also retrieves the similar results. (see Figure 1) Table 2 contains the raw data used in the graph, with the peaks in each database in bold.

Figure 1: Occurrence of the Term "Ecosystem Management" in Scholarly Journals

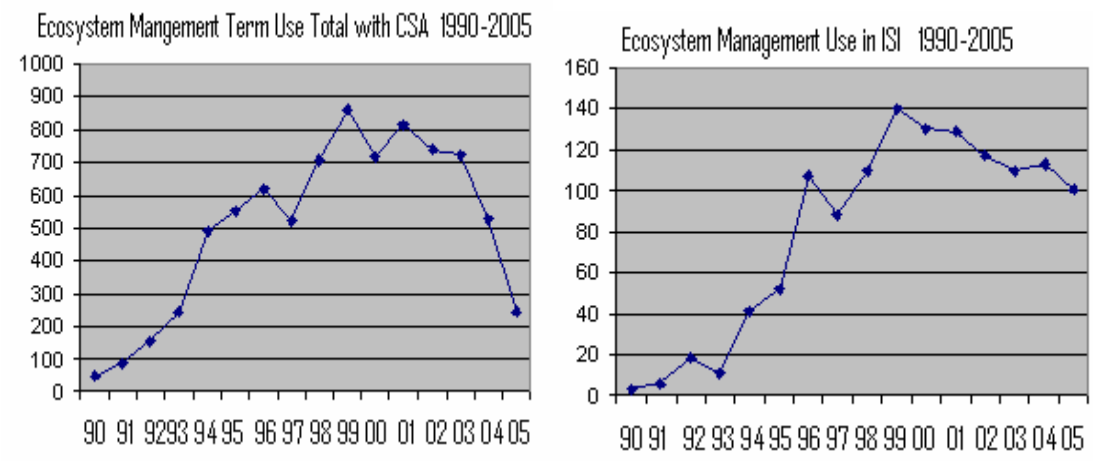

Table 2: Occurrence of the Term "Ecosystem Management" in Scholarly Journals

	CSA	Silverplatter	EBSCO	Bio/Ag	First Search	ISI	Total with CSA	Total without CSA
90	33	2	1	5	1	3	45	12
91	69	9	1	1	1	6	87	18
92	111	12	2	4	6	18	153	42
93	182	8	2	9	32	11	244	62
94	293	40	2	28	88	41	492	199
95	302	46	13	22	**115**	52	550	248
96	300	83	18	26	85	107	619	319
97	261	72	21	30	49	88	521	260
98	456	49	20	20	50	110	705	249
99	**512**	**95**	25	36	54	**140**	**862**	**350**
00	386	84	33	26	60	130	719	333
01	501	92	29	**45**	19	129	815	314

02	479	68	24	18	32	117	738	259
03	445	76	48	29	13	110	721	276
04	263	63	**52**	24	10	113	525	262
05	59	30	31	17	2	101	240	181

Interview Results

All of the agency respondents noted in increase of EM usage in the 1990s. (except NSF, explained later) Usage of the word at the present is "common" only in the FWS for management/non-biological situations. Other respondents presently notice the word used "sometimes": NRCS, FWS, MM. Still others notice usage of the word "rarely": DOE, NOAA, BLM, BOR, NFS, NPS, EPA. Rare usage in the BLM corroborates Bodine's research that found similar results, but rare usage in the NFS in this study is at odds with Bodine's findings that usage was common in the NFS. (Bodine 2005) Each agency experienced a decline from the increase in the 1990s. Mentioned below are factors contributing to the decline in EM usage, with generalizations of responses in the form of lessons in etymology and bureaucracy.

Lessons in Etymology:

For many agencies (MM, FWS, EPA) forming an alternative uses to the term "ecosystem management" allowed the agency members to clarify their respective agency's communication. Table 3 indicates some alternative words that agencies have used other than EM. As an example, MM began to emphasize that it manages many ecosystems, and so it began using "ecosystem-based management", because EM has connotations of managing a single ecosystem. In addition, according to the MM interviewee, while the agency does not have any legal responsibility to manage ecosystems from a more supreme perspective, those environmental regulations that it does follow are managed based on ecosystems. Another example is the FWS interviewee who said FWS kept EM usage in management situations because the connotations seemed to warrant that, but for the scientists another word was needed, which came to be landscape management. Usage of EM declined because it did not describe the agency activities properly. For example, the EPA member said that he sometimes hears terms such as watershed analysis/protection or landscape approach instead of ecosystem management. While the NPS never really used EM commonly, this member did mention that the omnibus Thomas Bill was created in 1998 for that agency to stop writing resource management plans and begin writing resource stewardship strategies. This change in emphasis, speculated the interviewee, might be representative of a national change in perspective.

The NFS stands alone as an agency that changed word usage due simply to the poor connotations applied to EM. The NFS interviewee said that EM connotations invoked images of government mandating controls on private property, whereas "landscape management" apparently doesn't have that affect.

Often the term ecosystem management was only used much because it was such a buzzword in the 1990s and other methods of describing EM existed. (NOAA, NRCS, BOR, DOE, BLM, NSF, NPS) As the NPS interviewee reported, the agencies don't want to be tied to one term, for words typically depend on the situation. The BOR interviewee said his agency has always used words like "watershed management" and the agency only used "ecosystem management" as was the style in the 1990s. "We don't have a formal policy on ecosystem management. That's one of those terms that come up and become a hot item inside bureaucracy. I've been through those cycles a lot with ideas like sustainability and biodiversity." As the NOAA interviewee said, "In the 1990s, 'ecosystem-based management' was the operative word. Then gradually 'ecosystem-approach' became in vogue more recently." This interviewee said new agency personnel sometimes used the term EM in the 1990s, but soon learned, due to the overwhelming use of the other words by coworkers, not to use EM anymore. The few times EM is used in this agency today is usually from the same workers who know no better. The BLM interviewee said that while he personally uses "ecosystem-based management", the terms that are used in the agency are site specific, such as "aquatic conservation." It is important to note, he added, that

such terms can be viewed as sub-concepts under EM, such as “stratifying the landscape”, “looking at whole landscapes”, or “protecting strongholds”. The NRCS interviewee said that “managers, for say grazing, operationalize words like “pragmatic grazing” to match their specific resource management situation.” This sort of phenomena occurs because, as NRCS interviewee said, “EM is not a sexy word”, and “people are comfortable with what they know”. The NSF interviewee was surprised NSF was even chosen for an interview, “NSF doesn’t even implement ecosystem management. We’re the only agency that’s not a mission agency. We do fund research that has implications regarding the concept. The best I could do is refer you to our grantees to examine the use of the words in the projects we fund.”

Because of the alternative uses described for EM, the words “landscape management” and “watershed management” were sampled in the journal databases to determine if these words replaced EM in literature over the years. The findings appear to be that the alternative words’ usage followed similar, but not as extreme, trends as ecosystem management over the last fifteen years. For example, “landscape management” (LM) appeared 2 times in the CSA database in year 1990, 18 in 1999, 38 times as a peak in 200, and 11 times in 2005. (1991 data was used to describe 1990 due to errors that included late 1980’s articles with 1990) “Watershed management” appeared 55 times in 1990, 111 times in 1999, 410 times as a peak in 2002, and 56 times in 2005. EM in the CSA database occurred 33 times in 1990, 512 times in 1999, and 59 times in 2005. Comparing the peak of each usage to the final point in 2005, EM had the most pronounced fall as a percentage. The results of the alternative words are in Figure 2.

Figure 2: “Watershed Management” and “Landscape Management” Term Usage

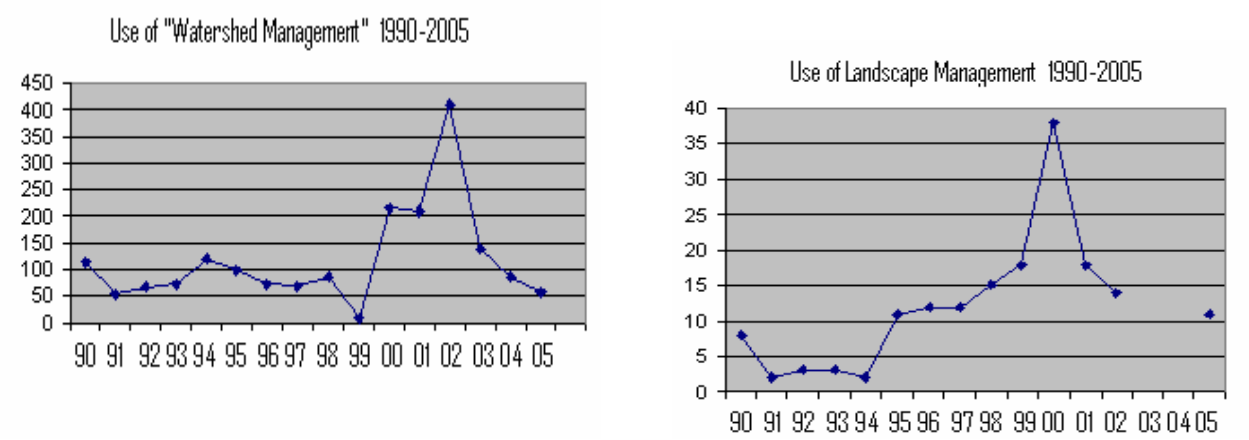

Table 3 - Alternative Words to “Ecosystem Management”:

NFS	landscape management
NRCS	ecosystem approach, ecosystem services
NOAA	ecosystem approach, ecosystem-based (to a lesser degree)
DOE	no common words
BLM	no common words, only themes depending on situation
BOR	watershed management
FWS	landscape management: scientists, ecosystem management: managers
MMS	ecosystem-based management
NPS	landscape management/ecology, species diversity, but not commonly
EPA	watershed analysis/protection and landscape approach, but not commonly

NSF none

Lessons in Bureaucracy:
A major factor contributing to an apparent decline in the term appears to be bureaucracy. Three contributing bureaucratic concepts were often cited: statutory mandates, executive mandate and CRS convention (mentioned in the introduction) causing an increase, and the change in Presidential Administration as a cause for decrease.

Laws cause and prevent usage:

Laws were one of the most common citations for changes in actual EM implementation, and thus EM term usage. (NPS, BOR, EPA, MM) NPS, for example, has received mandates requiring it to essentially administer to several social, economic, and environmental components in its parks. On the other hand, MM said that it has always implemented "EM", but that it doesn't cover anything comprehensive because it has no legal management responsibility. An interesting phenomena is that a couple of agencies (BOR, EPA) did seek to increase their EM activities, but were halted by government officials who said the agencies were going beyond their mandate. BOR, for example, for a project on the Republican River in Alaska during the EM executive push of the early 1990s, was told by its director to implement a project that would be most beneficial to the environment. The process was halted when it realized the agency realized, "we didn't have the funds for the project, nor were we mandated to do it anyway." As the interviewee mentioned pointedly, "We don't do ecosystem management, because it's difficult to do when you're program specific by Congress". As the EPA interviewee said, "EPA's organization is not set up for EM per se. Statutes drive us, and we don't have the wherewithal internally [to implement EM]. In 1990s there wasn't wide embracing at all of the term, but EPA was making a move [towards more implementation], but Congress said we were overstepping our bounds. There was a government shut down. Gingrich said they're not going to fund the government because they're doing the wrong things. EM was a code word for land-use planning throughout the country." The authority inherent in land-use planning, of course, is something that the government must have thought that EPA had no right to pursue. The interviewee did not know what exactly the EPA was doing wrong. He said he personally chooses to stay far from the political fray and not try to understand it.

Executive push and CRS convention as a cause for increase:

A few agencies cited the executive push and the CRS convention, mentioned in the introduction, in the early 1990s as factors that contributed to increased usage. According to the NRCS and MM members, who happened to write their respective agency's CRS Report, the purpose of the convention was to focus agencies' attention on learning to improve their EM activities. The NRCS interviewee said regarding what the convention was hoping to achieve: "… after the flash dies out, was there an infusion of technology and other necessary factors to implement EM?". All four of the agencies (NRCS, MM, DOE, BOR) mentioned that they were already implementing ecosystem management, but the pressures caused them to temporarily reevaluate their activities causing an increase in usage.

Change in Presidential Administration as a cause for decrease:

A few agencies cited the change from the Clinton to Bush Administration as a cause for decrease in usage, as a result of decreased EM implementation. (NFS, BLM, NFS, FWS) The NFS interviewee, for example, called the Administration change "a huge sea change", because the new Administration emphasizes timber and gas instead of environmental goods, which the Clinton Administration embraced. With the new Administration, the BLM interviewee said it felt implementing EM was "suspect", something that should not be done or at least done with caution. The DOE interviewee did not attribute the change in usage to the new Administration, but did note that with the

new Administration came requests from management to its employees to stop using phrases such as “global warming” and begin using “climate change”. This member suspects similar occurrences occurred at a nationwide level in regards to EM. The FWS interviewee was most concrete in its characterization of how the new Administration affected EM implementation. The FWS interviewee said that the former Interior Secretary proactively encouraged agencies to implement EM activities and kept EM decisions open for discussion, but the new Secretary is more solitary both in being less proactive and in decision-making. He said an example of the effects of this is a local Muskingham Watershed cleanup effort. The jurisdictions were not communicating and not taking necessary steps to cooperate. And because the new Secretary does not have that proactive inclination of the former Secretary, it is the opinion of this FWS member that the Muskingham effort never gelled. While all these agencies note the Administration change as a cause of decline, it should be noted that the decline started in 1999. As per the decline, the BOR interviewee said, “bluntly, the issue quite often is that executive orders are [only] to make people happy. The reality is that ecosystem management was fading even within the Clinton administration.” And he said he suspects that other agencies experienced this same phenomenon.

Discussion

The research findings offer a glimpse of federal agencies’ conceptualization of ecosystem management over time. The agencies themselves adopted the new term in the early 1990s, but use of the term subsequently fell out of favor in some agencies.

The research findings in this study affirm Bengston’s predictions. EM usage in academic literature has followed the same path as Bengston’s newspapers, with a few years’ lag time. This lag likely reflects the fact that academic analysis and publication takes more time than media reporting The fact that Bengston’s findings in usage declined might seem peculiar considering that he said the debates regarding EM have changed, for if the debates have changed, shouldn’t the newspapers reflect that the usage of the word continued for the new debates? And for that matter, shouldn’t EM in the scholarly literature and agency parlance reflect that? Trends in EM usage would not necessarily need to continue heavily to describe new debates if the conceptualization and usage has changed. Again, much of the literature during the peak of Bengston’s findings was in regards to defining and critiquing EM, but he felt new conceptualizations have emerged. According to agency responses, EM issues have been evolving to conceptualization issues. Moreover, simply perusing the content of recent academic literature seems to indicate that newer literature is also less geared towards defining/critiquing and affirming that the fundamental debates of EM have changed into conceptualization debating. But of course, this perusal of literature to corroborate the change should be more objectively verified. So, the decline in scholarly and agency use of the term, despite continuing debates over the concept, seems reasonable. Thus the concept is debated using different terms. Considering data from the databases to verify trends in common terms such as “landscape management”/”watershed management” decreased at a lesser rate than EM, perhaps the fact that the new words remained in stronger use than EM could reinforce the notion that those are the choice terminologies. This notion is reinforced by the responses from agency personnel that the alternative words arose over the study period as a replacement for EM.

While substantive EM hindrances, such as scientific misunderstandings, were not cited as reasons that caused EM usage decline, authors such as Fitzsimmons (1996) who said that EM would go nowhere have some merit as well. This is primarily because many of the agencies had trouble implementing an all-encompassing concept like EM. Instead, they broke EM into sub-concepts to pursue. This dissection into manageable components of EM corroborates Bodine’s

findings regarding how the BLM and the NFS have handled EM implementation. (2005) As the NFS interviewee put it, while the EM terminology is declining, other related terms have emerged and the need for implementing EM is still strong.

A couple of questions might arise from a critical eye to the perceptions of actual EM implementation. The agencies claim that their ecosystem management efforts have been increasing over the years, yet we know that there exist many hurtles to implementing ecosystem management (Riggs 2001, Bodine 2005). In response to this point, the FWS interviewee said that *overall* implementation of ecosystem approaches has increased. Another issue, as mentioned in the etymology section, is that most of the agencies changed their usage of words because they did not perceive themselves as implementing EM, yet they usually said that they were increasing EM implementation. What seems to be the case is that the tacit understanding of EM is balancing economic uses with a stress on the environment. And this seems somewhat reasonable, for if EM simply means balancing uses, the concept could rightfully be called multiple use, as is a catch phrase for multiple use laws. With this tacit understanding, incidentally, a thorough definitional and conceptual framework such as Grumbine's that emphasizes protecting native ecosystem integrity seems reasonable. Because many agencies lack the mandate to manage this way, they say they do not implement EM. But the fact they say their EM implementation has increased shows that people are still willing to refer to EM in generic terms in passing conversation. The general notion of managing an ecosystem still exists. As the BLM interviewee said, "EM is an abbreviation for a lot of things."

Further studies could be conducted to determine how these conceptualizations and conditions translate into actual EM implementation. Because no substantive limitations were cited and the underlying conceptualizations occurred due to the very fact that EM is being implemented, further researchers can take this as an indicator that at least versions of ecosystem management are indeed being implemented that can be further studied. Because versions of implementation exist, they can then be measured against more objective measurements of EM. For example, Koontz (2002) created criteria to measure how much EM is being implemented. Each agency could then be compared to that ideal. What would probably occur would be that each agency would reflect its ability to implement EM, according to Koontz's arguably environmentally toned characterization of EM, using phrases such as maintaining "ecological integrity", based on laws and other factors which would direct their implementation. This largely occurred already but less objectively in this research as indicated by agencies claiming that they cannot implement an all-encompassing EM without the legal mandate, but still claim to be implementing at least a version of EM more than ever. Of course, Koontz's method is just one of many possible methods by which to measure and analyze implementation. Such research could help policy makers determine if the new conceptualizations and resulting practices are desired in order to possibly change laws, which might give agencies more authority to implement more broadly encompassing EM. Such changes could allow the BOR and EPA, who were shown to have gone beyond their mandates, to have more autonomy to implement an environmentally friendly project, instead of acting as a tools for other agencies and entities. The possibility of such changes would probably open way to determining if the political will exists to reformat the way agencies operate and spend money to alter the status quo of existing practices and concepts, as demonstrated in agency responses.

At any rate, by first understanding that EM is still occurring and that conceptualization, and arguably implementation, varies by the agency, research can also begin to more clearly measure if agencies are implementing their own EM efforts to their optimal ability. As NRCS mentioned, the purpose of the CRS convention was to direct agencies to achieve this goal. NRCS, for itself, mentioned that it has integrated teaching its new employees about EM, but can all the other agencies who are capable stake this claim, even agencies such as MM? And one also might examine how much training would be necessary for MM, given its differences from agencies such as NRCS. Moreover, we see BLM struggling to organize its data, but is it even possible for the agency to accomplish this, especially as evidenced by how other agencies may or may not have handled data organization? At the very least, given this or further research,

another convention could be called to examine why and how the agencies have evolved since the last convention, in order to direct their future in EM implementation.

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Appendix

Databases

CSA Illumina: includes 100 bibliographic and full-text databases and journals in four primary editorial areas: natural sciences, social sciences, arts & humanities, and technology.
http://www.csa.com/csaillumina/login.php

Silverplatter: includes over 1,200 journals, over 160 books, and more than 300 databases in medical and general scientific and academic research information.
http://www.silverplatter.com
http://web5.silverplatter.com/webspirs/start.ws

ISI: includes approximately 8,500 journals in over 250 disciplines in the sciences, social sciences, and arts and humanities.
http://www.isinet.com/

EBSCO: includes over 150 databases with thousands of e-journals
ejournals.ebsco.com/

First Search: includes over 10 million full-text and full-image articles
http://firstsearch.oclc.org/

BAI: Biological and Agricultural Index: includes over 240 periodicals in agriculture, agricultural chemicals, animal husbandry, biochemistry, biology, biotechnology, botany, cytology, ecology, entomology, environmental science, fishery sciences, food science, forestry, genetics, horticulture, limnology, microbiology, nutrition, physiology, plant pathology, soil science, veterinary medicine, and zoology
http://olc5.ohiolink.edu/bin/gate.exe?f=search&state=6n7m2.1.1

Semi-structured Interview Questions:

1. How has your agencies definition of “ecosystem management changed over time? Why? * Do you even use the term EM anymore? About when did your agency officially embrace EM? *describe the most important reason why you think it changed, if it did, along with other reasons that maybe weren't as important but were still reasons.

2. Are there any alternative terms your agency uses instead of "ecosystem management"? If so, what are they, and in what context would you use these terms instead? In what context would you use EM?
Have the terms been replacing ecosystem management?

3. How does usage vary within your organization by region across the country? Why does it vary so?

Optional:

4. How has your implementation of ecosystem management varied over the last fifteen years?

5. What do you attribute to this phenomenon: I noticed a lack of literature regarding ecosystem management. So, I sampled a variety of databases of academic journals. I noticed that the usage of the term “ecosystem management” began increasing substantially in the early 1990’s, peaked in 1999, and then began declining just as fast as it had risen. (Parabolic)